Doc Ref. FP3
Appl. No. 10/607,541

(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 299 669 B1**

16800 U.S.PTO
29/203335
041404

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication of patent specification: **15.12.93** (51) Int. Cl.5: **A43B 13/18**

(21) Application number: **88306144.2**

(22) Date of filing: **06.07.88**

(54) Sports or casual shoe with shock absorbing sole.

(30) Priority: **09.07.87 GB 8716200**
31.05.88 GB 8812867

(43) Date of publication of application:
18.01.89 Bulletin 89/03

(45) Publication of the grant of the patent:
15.12.93 Bulletin 93/50

(84) Designated Contracting States:
AT BE CH DE ES FR GR IT LI LU NL SE

(56) References cited:
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EP 0 299 669 B1

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16800 U.S.PTO 29/203335 041404

Description

The present invention relates generally to sports shoes or casual shoes and more specifically concerns shoes incorporating improved shock absorbing soles.

BACKGROUND OF THE INVENTION

Generally speaking, most people put their bodies under varying degrees of impact during exercise and it has been established that the forces exerted on the heel and the ball or front sole of the feet during running are three to four times higher than those exerted during normal walking. Thus during running or jogging the reaction forces exerted on the body from the ground may be three to four times higher than individual body weight and not only is this the cause of many sports injuries but also it makes the participants tired or exhausted. Sports shoes for running or jogging or playing games and casual shoes for walking are commercially available in a variety of designs, but generally speaking the soles of such shoes and consequently the shoes in their entirety do not match the individual requirements of the wearer as regards providing the desired degree of resilience and elasticity.

It is known to provide means in a sports shoe for enabling the characteristics of the shoe to be adapted to the requirements of the user. For example, in US Patent No. 4 430 810 there is described an arrangement wherein a number of bores extend through the relatively soft material of the heel portion of a running shoe from one side thereof to the other, the bores being spaced apart from each other in the longitudinal heel-to-toe direction of the shoe, and rod-shaped stiffening members of selectable greater hardness than the soft heel material can be inserted into the bores so as selectively to increase the overall hardness of the sole and adapt the shock-absorbing capabilities of the shoe to the individual requirements of the runner and to the nature of the surface upon which he intends to run. The proposal to stiffen the heel of a shoe by insertion of appropriate stiffening elements into bores in the heel is known also from French Patent No. 958766, and in US Patent No. 3785646 there is disclosed a shoe having a rubber sole with transverse bores into which rod-like metal weights may be inserted. Another arrangement is known from our British Patent No. 2156654 which not only enables heel hardness characteristics to be selectively varied to suit the requirements of the wearer, but also allows different relative hardnesses to be achieved on different sides of the heel for controlling rear-foot movement and minimizing the risk of damage through excessive pronation or supination. Another known arrangement of only marginal interest to the present invention is disclosed in European Patent Application Serial No. 0161653.

It is further known to incorporate air pockets into the heel portion and/or the sole portion of a shoe so as to provide shock absorption and/or resiliency properties. Described in British Patents Nos. 2150010 and 2183446 are shoes which incorporate an inflatable bladder within a cavity in the heel portion of the shoe, the degree of inflation of the bladder in each case being selectively variable. The shoe of British Patent No. 2150010 also incorporates a plurality of sealed air pockets generally in the metatarsal region of the ball of the foot. Disclosed in European Patent Application Serial No. 0160880 is a moulded shoe sole wherein air can transfer between cavities defined by bulges moulded into the sole and heel portions for providing shock absorption and movement facilitation characteristics, though without any possibility of adjusting the air pressure within the cavities. A similar arrangement to that disclosed in European Patent Application Serial No. 0160880 is described in British Patent Application No. 2073006, and in the latter case means are provided to enable the desired fluid pressure in the interconnected cavities to be determined. A shoe provided with a selectively inflatable insole is described in British Patent No. 358205. The shoe described in International Patent Application No. WO 82/00571 has a gas pressure chamber in its sole and includes a pump arrangement which keeps the gas pressure constant. Other shoes incorporating pneumatic structures in their heel and/or sole portions are described in British Patent Specifications Nos. 390368, 490647, 2023405 and 2034169 and in US Patent Specifications Nos. 4 183 156, 4 219 945 and 4 271 606.

None of the aforementioned documents is considered to disclose a sports shoe which affords to the user a sufficient degree of resilience coupled with selectability as regards hardness characteristics particularly within the heel region of the shoe.

SUMMARY OF THE INVENTION

According to the present invention there is provided a sports shoe or casual shoe comprising an upper, a sole, and a removable footbed, said sole comprising a wear-resistant outsole, a midsole, and an insole, said removable footbed overlying said insole, and wherein an opening in said insole in the region thereof which corresponds to the heel of said shoe communicates with a recess in said midsole, and a pneumatic resilient member is accommodated in said recess, as known from GB-A-2183446 for example, the shoe according to the invention being characterized in that said pneu-

16800 U.S.PTO 29/203335 041404

matic resilient member comprises a generally cylindrical body portion axially received in said recess and supported by the axially innermost end of said recess, and an enlarged head portion having a domed upper surface underlying said removable footbed and peripherally supported by said insole, the cylindrical surface of the body portion of said pneumatic resilient member being concertina-pleated whereby the pneumatic resilience of said member is predominantly axially directed.

In the structure of an exemplary sport or casual shoe in accordance with the present invention, the shoe has an upper, a sole extending the full length of the shoe from the heel to the toes and a removable footbed, and the sole comprises a treaded wear-resistant outsole, a mid-sole portion formed for example of foamed plastics material and an insole formed of a board material such as Texon board. The heel, and possibly also the metatarsal region of the front sole, is provided with one or more punched holes or otherwise formed recesses which penetrate through the insole and part way through the mid-sole towards the outsole. These recesses underlying the removable footbed are accessible to the wearer and may be used by the wearer to removably accommodate pneumatic resilient members as aforesaid, more specifically comprising generally cylindrical air-filled bodies axially received within the recesses and having concertina-folded cylindrical walls whereby the resilience of the bodies is concentrated predominantly in their axial direction so as to be of greatest assistance to the wearer of the shoe. The air-filled bodies may be arranged to be selectively inflatable for determining their hardness characteristics so as to ensure that they provide adequate elasticity and support during sporting and recreational activities.

By virtue of the shoe structure according to the present invention, impact forces arising from contact with the ground can be accommodated to suit the special requirements of the user. Particularly in the case where the bodies incorporated into the shoe sole are inflatable but also in other cases where they are simply replaceable by alternative bodies of different resilience characteristics, the shock absorber bodies can be selectively adjusted to provide or to maintain a given elastic response. Furthermore, the weight of the shoe itself can be reduced, because the punched hole portions can accommodate insert bodies in the form of air sacs which are certainly lighter than the EVA or PU (polyurethane) materials commonly used for the midsole; during exercise, the lighter the shoes, the greater generally are the benefits to the exerciser. Additionally, the geometric shape of the insert bodies enables optimum elasticity characteristics to be achieved, and by providing the wearer with direct access to the insert bodies, the option is obtained to further increase the flexibility of use by varying the degree of inflation of the bodies with air or other gases, or even by the injection of fluids such as oils, emulsions, water, hydrogen, helium etc., into the bodies.

Other features of the present invention are set forth with particularity in the appended claims and will become apparent from the following detailed description of exemplary embodiments which are illustrated in the accompanying drawings.

DESCRIPTION OF THE DRAWINGS

Fig.1 shows schematically a side-elevation view of the construction of the heel portion of an exemplary sports shoe in accordance with the present invention; and

Fig.2 is a schematic sectional end-elevation view of the heel portion of the sports shoe of Fig.1.

DESCRIPTION OF THE EMBODIMENT

Referring to Figs.1 and 2 of the drawings, the shoe shown schematically therein comprises an upper 21 and a sole 22, the sole comprising a rubber outsole layer 23, a midsole 24 formed of one or more layers of compression moulded EVA for example, an insole 25 formed of Texon board for example, and a removable footbed 26 which desirably is reinforced so as to contribute to the lateral stability of the shoe for example by being transversely ridged. As shown, an opening 27 is provided in the insole 25 in registry with a recess 28 formed in the midsole 24, a reinforcing piece of Texon board 29 is provided in the bottom of the recess 28, and a gas-filled member 30 is received partially within the recess 28.

The gas-filled member 30 as shown has a domed upper or head portion 31 of greater transverse dimension than the opening 27 provided in the insole 25 so that such head portion 31 does not fit into the recess 28 formed in the midsole 24, but rather rests upon the upper surface of the Texon insole 25 around the periphery of the opening 27 and defines an upwardly domed gas cushion seated on the insole. A body portion 32 of the gas-filled member 30 is of generally cylindrical shape with concertina side walls as shown and a flat base and fits into the recess 28 formed in the midsole 24.

The gas-filled member 30 is preferably arranged to be removable from its accommodating recess in the shoe sole and different members having different gas pressures can be made available whereby the shoe can be configured to suit the requirements of the user. Additionally, or alternatively, the gas-filled member 30 can as shown be provided with a valve 33 enabling it to be selectively inflated or deflated, thus to increase or de-

16800 U.S.PTO
29/203335
041404

crease the hardness characteristics of the member 30 body for matching the shoe to the body weight and individual requirements of the wearer. This facility is advantageous particularly in the course of a long run, such as a marathon, or a long game since it enables the shoe characteristics to be adjusted during the run or during the game to take account of different conditions and changing levels of fatigue. On a long run, running shoes can become up to 15 °C hotter than at the start of the run, on account of friction effects, which can cause the member 30 to become undesirably firm and insufficiently cushioning. This problem can be overcome by adjusting the pressure of the inflatable member 30. In use of a sports shoe constructed in accordance with the present invention, the presence of the resilient member provides excellent cushioning and protection against shock, and also provides a resilience to the shoe characteristics which is invigorating and beneficial, the resilience of the gas-filled member as it resiles from its compressed state as the foot is lifted providing a positive spring to the step of the wearer.

By virtue of the concertina-pleated side walls of the gas-filled member 30, the advantage is obtained that the pneumatic resilience of the member is substantially unidirectional and in the axial direction of its accommodating recess which is advantageous as regards the stability of the shoe.

The lateral edges of the midsole 24, at least in the region of the heel of the shoe, may be of increased durometer hardness than the central midsole region to ensure that the lateral stability of the shoe is maintained during the life of the shoe. This might for example be achieved by forming the midsole of a number of different portions formed of different density materials and adhered together.

The gas-filled member 30 can be made in the form of a single hollow gas-filled sac formed of a suitable synthetic plastics material, or could be a composite body formed as a plurality of gas-filled sacs adhered together. Alternatively, the gas-filled member 30 could be formed in whole or in part as a closed-cell foamed plastics structure. Additionally, pneumatic resilience could be provided in the ball of the foot region of the shoe by incorporation therein of resilient bodies similar to the member 30 or of any other suitable shape and form. Furthermore, whilst Figs. 1 and 2 show the provision of only one resilient member 30 in the heel of the shoe, it will be appreciated that more than one such member could be provided.

Claims

1. A sports shoe or casual shoe comprising an upper, (21) a sole (22), and a removable footbed (26), said sole comprising a wear-resistant outsole (23), a midsole (24), and an insole (25), said removable footbed (26) overlying said insole (25), and wherein an opening (27) in said insole (25) in the region thereof which corresponds to the heel of said shoe communicates with a recess (28) in said midsole (24), and a pneumatic resilient member (30) is accommodated in said recess, characterized in that said pneumatic resilient member (30) comprises a generally cylindrical body portion (32) axially received in said recess and supported by the axially innermost end of said recess, and an enlarged head portion (31) having a domed upper surface underlying said removable footbed (26) and peripherally supported by said insole (25), the cylindrical surface of the body portion (32) of said pneumatic resilient member (30) being concertina-pleated whereby the pneumatic resilience of said member (30) is predominantly axially directed.

2. A shoe as claimed in claim 1 wherein said pneumatic resilient member (30) is removably received in said recess (28).

3. A shoe as claimed in claim 1 or 2 wherein a plurality of said recesses (28) are provided in the heel region of the shoe and a said pneumatic resilient member (30) is accommodated in each said recess (28).

4. A shoe as claimed in claim 1 or 2 or 3 wherein the pneumatic resilience of the or each said pneumatic resilient member (30) is selectively adjustable by virtue of the or each said pneumatic resilient member (30) comprising a gas-filled body including valve means (33) whereby the gas pressure may be selectively adjusted.

5. A shoe as claimed in any of the preceding claims wherein a plurality of further recesses are formed in said midsole (24) in the region thereof corresponding to the metatarsal region of a wearer's foot and a resilient body is received in each of said further recesses.

6. A shoe as claimed in claim 5 wherein the resilient bodies received in said further recesses are removably received therein for enabling the hardness characteristics thereof to be selected by a user, the further recesses being accessible by removal of the removable footbed (26).

7. A shoe as claimed in any of the preceding claims wherein the lateral edges of the midsole, at least in the region of the heel of the shoe are of increased durometer hardness

16800 U.S.PTO
29/203335
041404

than the central midsole region.

Patentansprüche

1. Sport- oder Freizeitschuh, umfassend einen Schaft (21), eine Sohle (22) und ein herausnehmbares Fußbett (26), wobei die Sohle eine abriebfeste Laufsohle (23), eine Zwischensohle (24) und eine Brandsohle (25) umfaßt, wobei das herausnehmbare Fußbett (26) auf der Brandsohle (25) liegt, und wobei eine Öffnung (27) in der Brandsohle (25) in ihrem dem Schuhabsatz entsprechenden Bereich mit einer Ausnehmung (28) in der Zwischensohle (24) in Verbindung steht und in dieser Ausnehmung ein pneumatisches elastisches Element (30) untergebracht ist, dadurch gekennzeichnet, daß das pneumatische elastische Element (30) einen generell zylindrischen Hauptteil (32), der in der Ausnehmung axial angeordnet ist und auf deren axial innerstem Ende aufliegt, sowie einen sich an seinem Rand auf der Brandsohle (25) abstützenden erweiterten Kopfteil (31) mit einer unter dem herausnehmbaren Fußbett (26) liegenden balligen Oberfläche aufweist, wobei die Zylinderfläche des Hauptteils (32) des pneumatischen elastischen Elements (30) mit einer Ziehharmonika-Faltung versehen ist, so daß die pneumatische Elastizität dieses Elements (30) vorwiegend axial gerichtet ist.

2. Schuh nach Anspruch 1, wobei das pneumatische elastische Element (30) herausnehmbar in der Ausnehmung (28) angeordnet ist.

3. Schuh nach Anspruch 1 oder 2, wobei im Absatzbereich des Schuhs mehrere der Ausnehmungen (28) vorgesehen sind und in jeder davon ein besagtes pneumatisches elastisches Element (30) angeordnet ist.

4. Schuh nach einem der Ansprüche 1 bis 3, wobei die pneumatische Elastizität des bzw. jedes pneumatischen elastischen Elements (30) dadurch selektiv einstellbar ist, daß es einen gasgefüllten Hauptteil mit einer Ventileinrichtung (33) zur selektiven Einstellung des Gasdrucks umfaßt.

5. Schuh nach einem der vorhergehenden Ansprüche, wobei in der Zwischensohle (24) in deren dem Mittelfußbereich des Trägers entsprechenden Bereich mehrere weitere Ausnehmungen ausgebildet sind, in deren jeder ein elastischer Körper angeordnet ist.

6. Schuh nach Anspruch 5, wobei die elastischen Körper in den weiteren Ausnehmungen herausnehmbar angeordnet sind, so daß der Benutzer ihre Härteeigenschaften wählen kann, und wobei die weiteren Ausnehmungen durch Entfernen des herausnehmbaren Fußbetts (26) zugänglich sind.

7. Schuh nach einem der vorhergehenden Ansprüche, wobei die Seitenkanten der Zwischensohle mindestens im Bereich des Schuhabsatzes eine höhere Durometer-Härte aufweisen als im mittleren Zwischensohlenbereich.

Revendications

1. Chaussure de sport ou chaussure de loisir comprenant une empeigne (21), une semelle (22) et une première amovible (26), ladite semelle comprenant une semelle externe résistante à l'usure (23), une semelle intermédiaire (24) et une semelle intérieure (25), ladite première amovible (26) recouvrant ladite semelle intérieure (25) et dans laquelle une ouverture (27) dans ladite semelle intérieure (25) dans la zone correspondant au talon de ladite chaussure communique avec un creux (28) dans ladite semelle intermédiaire (24) et une pièce élastique pneumatique (30) est logée dans ledit creux,

   chaussure caractérisée en ce que ladite pièce élastique pneumatique (30) comprend une partie de corps globalement cylindrique (32) logée, de façon axiale, dans ledit creux et supportée par l'extrémité axiale la plus interne dudit creux et une partie de tête agrandie (31) possédant une surface supérieure bombée sous-jacente à ladite première amovible (26) et supportée sur la périphérie par ladite semelle intérieure (25), la surface cylindrique de ladite partie de corps (32) de ladite pièce élastique pneumatique (30) étant plissée de façon télescopique, l'élasticité pneumatique de ladite pièce élastique pneumatique (30) étant ainsi essentiellement axiale.

2. Chaussure selon la revendication 1, dans laquelle ladite pièce élastique pneumatique (30) est logée, de façon amovible, dans ledit creux (28).

3. Chaussure selon la revendication 1 ou 2, dans laquelle une pluralité desdits creux (28) sont prévus dans la zone de talon de la chaussure et une dite pièce élastique pneumatique (30) est logée dans chacun desdits creux (28).

4. Chaussure selon la revendication 1, 2 ou 3, dans laquelle l'élasticité pneumatique de la ou de chaque dite pièce élastique pneumatique

16800 U.S.PTO 29/203335 041404

(30) est réglable, de façon sélective, en vertu de la ou de chaque dite pièce élastique pneumatique (30) comprenant un corps rempli de gaz muni d'un moyen de soupape (33), la pression du gaz pouvant être ainsi réglée de façon sélective.

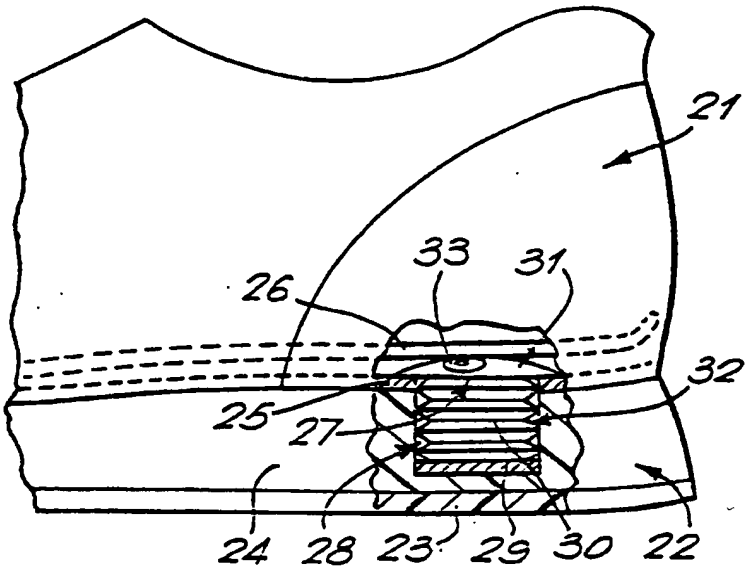
5. Chaussure selon l'une quelconque des revendications précédentes, dans laquelle une pluralité de creux supplémentaires sont formés dans ladite semelle intermédiaire (24) dans une zone correspondant à la région du métatarse du pied de l'utilisateur et un corps élastique est logé dans chacun desdits creux supplémentaires.

6. Chaussure selon la revendication 5, dans laquelle les corps élastiques logés dans lesdits creux supplémentaires sont reçus, de façon amovible, pour permettre à sa caractéristique de dureté d'être choisie par un utilisateur, les creux supplémentaires étant accessibles par enlèvement de la première amovible (26).

7. Chaussure selon l'une quelconque des revendications précédentes, dans laquelle les bords latéraux de la semelle intermédiaire, au moins dans la zone du talon de la chaussure, présentent une dureté accrue par rapport à la zone de la semelle intermédiaire centrale.

16800 U.S. PTO
29/203335
041404

FIG.1.



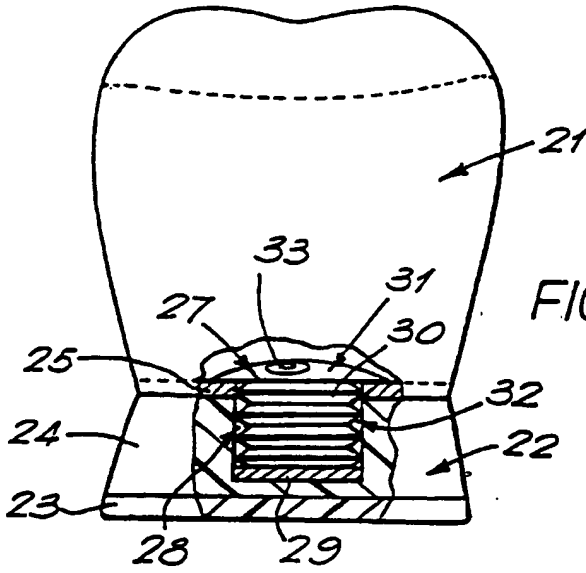


FIG.2.